Study on feeding habits of Mekong giant catfish in Mae peum Reservoir, Thailand

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ABSTRACT
In order to recapture Mekong giant catfish, we developed an automatic fish recapture system (AFR system). The AFR system causes the free-ranging fish to float at the scheduled time. We have conducted experiments on Mekong giant catfish in the Mae peum reservoir, Thailand. We used 7 cultivated young catfish, whose total length ranged from 76.5 cm to 86.5 cm. After we attached the AFR system to the catfish, we released them into the reservoir in August (one catfish), October (three catfish) and December (three catfish) of 2004. The AFR systems were scheduled to cause the catfish to float after four to eight days. The recovery percentage of both the catfish and the AFR systems was 43 %. The recovery percentage of only the AFR systems was 29 %. The percentage of loss of all the catfish and the AFR systems was 29 %. We also examined the stomach contents of the catfish with a microscope and found some zooplankton and phytoplankton. The total number of the zooplankton in the stomach contents in October was 1288 individuals and the most, and those in August and December were 33 and 34 individuals respectively and least.

KEYWORDS: Mekong giant catfish, Automatic Fish Recapture System (AFR System), stomach contents

INTRODUCTION

Mekong giant catfish (Pla Buk in Thailand), *Pangasianodon gigas* (Chevey, 1930), is endemic to the Mekong basin. The catfish is one of the largest fresh water fish in the world and the biggest record is 293kg with the total length 3m. The catfish is delicious and is also valuable animal protein resources for the residents in the north of Thailand (Akagi et al., 1996). However, due to the watershed development of the Mekong River these days and due to the incidental catch and so on, the number of the wild catfish in the Mekong River has decreased year by year (Mattson et al., 2000 and Hogan, 2004). Therefore, the catfish is listed on IUCN Red List for Critically Endangered and is included in CITES Appendix I for most endangered species. So the import and export is strictly regulated.

In Thailand the catches of the catfish is strictly restricted, for example, only the fishery cooperative of Chaing Khong District, in the north of Thailand is allowed to capture the wild catfish, and only from April to June when the water level rises. In order to conserve and enhance the catfish resource, the Thai government has put the above mentioned fishing restrictions on and conducted artificial hatching studies to increase the catfish resource since 1980s. In 2001, they succeeded in producing second filial generation (F2) from first filial generation (F1) of the catfish.

Recently studies on the catfish have been conducted using the cultivated catfish as well as the wild catfish. The behavior of the catfish has become apparent (Akagi et al., 1996, Mitamura et al., 2003, Mitamura et al., 2003 and Mitsunaga et al. 2004). For example the wild adult catfish fed on the adherent filament algae in the Mekong River or cultivated juvenile catfish had omnivorous and cannibalism in the fish pond (Ayanomiya, 1989, Ajisaka, 2004 and Mattson et al., 2000). But the habits of the cultivated young catfish in the natural environment are still unknown. It is very important to know the feeding habits of the catfish in the natural environment, because we can't know whether the catfish is dead or alive in the natural environment (if they are released into the natural environment for their conservation and enhancement) unless we have the knowledge of their feeding habits. Conversely, if we know their feeding habits, the environmental capacity of the catfish is apparent so that we can efficiently conserve and enhance the catfish. Therefore, the objective of this paper is to obtain knowledge about feeding habit of the cultivated young catfish under the natural environment.

MATERIALS AND METHODS

AFR system

The stomach contents analysis is one method to know feeding habits. To make the stomach contents analysis is necessary to catch the catfish. Furthermore, we can only conduct the analysis as soon as we catch them due to digestion of the stomach contents. In general, we depend on fisherman for recapturing of the fish. However, using these methods we could not certainly recapture the particular fish at any time we want. Therefore, we developed a new device for recapturing free-ranging fish at any time (Yamagishi et al., 2005).

The AFR system is a device to cause the free-ranging fish to float at the scheduled time. The system consists of an inflated life jacket, a CO_2 cylinder, a time controllable trigger and a radio transmitter. Then, we search for the floating fish with the AFR system using a radio receiver and a Yagi-antenna to detect signals from the radio transmitter.

Recovering experiments of the catfish

In August, October and December 2004, we conducted recapturing experiments on Mekong giant catfish at the Mae peum Reservoir in Phayao province, northern Thailand (Fig. 1 and Table 1). The reservoir is constructed by damming up a river. We used 7 cultivated catfish stocked at Phayao Inland Fisheries Station, whose total length ranged from 77.0 cm to 86.5 cm. We didn't feed any catfish for 1 week before releasing. After we externally attached the AFR system to the back of the catfish under anesthesia same as Eveson and Welch (2000) and Tanaka et al. (2001), we released them into the reservoir (Fig. 1). The AFR systems were scheduled to cause the catfish to float after four and eight days. Then, we searched for the floating fish with the AFR system using a radio receiver by the ship.

The obtained stomach contents were fixed with 10 % formalin solution or 70 % ethanol and examined by using an optical microscope. From the examination under the microscope, the stomach contents were plankton. So they were identified down to family, order or genus (Tanaka, 2002 and Yamagishi, 1999). We counted the number of the individuals of zoo plankton and the number of the cells of phytoplankton.

Plankton survey in Mae peum Reservoir

It is assumed that the results of the No.1 catfish in August showed the catfish fed on the plankton in the reservoir, so the survey of the plankton composition in the reservoir was carried out in December. The plankton were vertically sampled from 6 m depth to the surface at 4 stations using the plankton net (mesh size: 63μm) (Fig. 1). The obtained plankton were fixed with 10 % formalin solution and examined using an optical microscope. They were identified down to family, order or genus (Tanaka, 2002 and Yamagishi, 1999). We counted the number of the individuals of zooplankton and the number of the cells of phytoplankton.

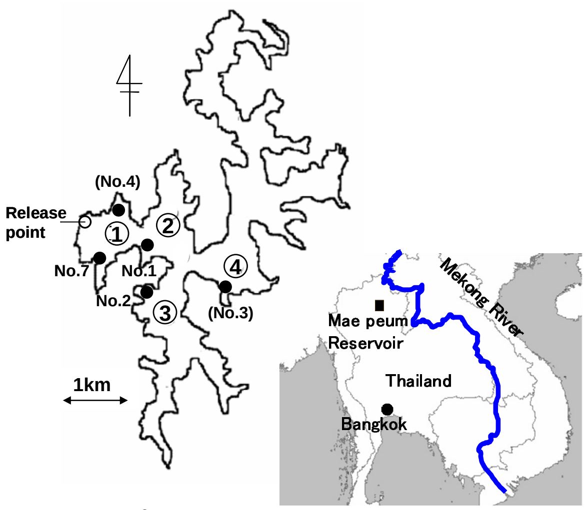


Fig.1. Map of study site, Mae peum Reservoir in Phayao Province, a northern part of Thailand. This reservoir was constructed by damming up the river. The area of this reservoir was approximately $8.3 km^2$. The circled numbers from 1 to 4 are the station of the receiver systems and sampling position of plankton.

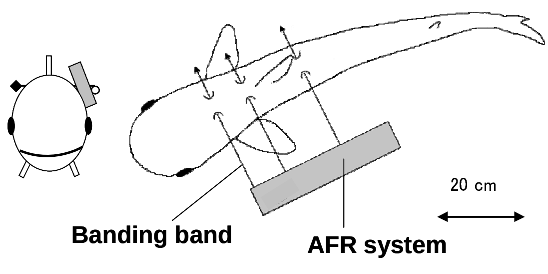


Fig. 2. Attachment of AFR System to the catfish (Left: Front view, Right: Top view).

Table 1. Details of the catfish. Parenthetic recaptured dates are date in which we recaptured the AFR system only.

No.	TL (cm)	BW (kg)	Released date	Sampling Periods (day)	Scheduled date	Recaptured date	Weight of Gut contents (g)
1	85.0	6.8	Aug. 1, 10:00	4	Aug. 5, 11:00	Aug. 5, 11:00	26.8
2	78.0	4.4	Oct. 22, 10:30	4	Oct. 26, 11:00	Oct. 26, 11:04	26.9
3	85.0	6.3	Oct. 22, 10:30	4	Oct. 26, 13:30	(Oct. 27, 10:27)	-
4	81.0	5.0	Oct. 22, 10:30	4	Oct. 26, 15:30	(Oct. 26, 17:00)	-
5	76.5	4.0	Dec. 12, 11:00	8	Dec. 20, 11:30	-	-
6	86.5	6.5	Dec. 12, 11:00	8	Dec. 20, 13:30	-	-
7	77.0	4.4	Dec. 12, 11:00	8	Dec. 20, 15:30	Dec. 20, 16:40	22.1
	81.3±4.2	5.4±1.0					26.8±2.7

RESULTS AND DISUCUSSION

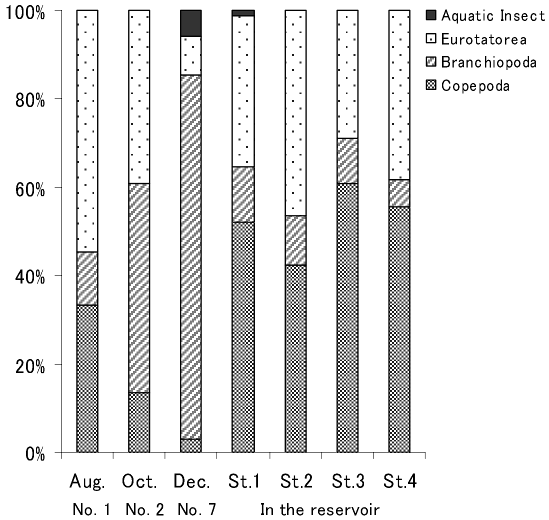
The result of recovering experiments is shown in Table 1. The recovery percentage of both the catfish and AFR system was about 43 %. The recovery percentage of only AFR system was about 29 %. One reason was that the fisherman caught the No. 4 catfish by the gillnet before starting, the other was that the ship couldn’t go to the surfacing point of No.3 catfish due to a great amount of floating weeds. The percentage of loss of all the catfish and AFR system was about 29 %. The reason was that the catfish with the AFR system might die and then catch in the standing timbers while causing the catfish to float after the AFR system started. One cause why the catfish died might be that the effect of the AFR system on the catfish was too great, the other might be that the water temperature in the reservoir was too cold for their catfish. We would like to reveal the cause of death in near future. And we will reduce the size and weight of the AFR system for the reduction of the effect.

The results of the examination under the microscope are shown in Table 2, Fig. 3 and 4. The stomach contents which we could identify were plankton. Upper Fig. 3 illustrates the percentage of zooplankton found in the stomach of three different catfish over the course of 5 months and the percentage of zooplankton in the reservoir. Variable change was noted in the stomach contents of each fish at different times of the year. In August, No. 1 was found 55 % Eurotatrea, 12 % Branchiopoda and 33 % Copepoda. Now there is a change from August to December. In December, No. 7 Branchiopoda demonstrated an increase of about 35 % while the Eurotatorea and the Copepoda demonstrated a decrease of about 20 % and 15 % respectively. The results might be due to the change of seasons. You’ll notice a steady increase of 35 % from the No. 1 to No. 3 every 2 months. While the zooplankton composition of all stations in the reservoir were same, zooplankton composition of all stomach contents were varied. On the other hand, we couldn’t identify the phytoplankton in all stomachs. The phytoplankton in the stomachs in December wasn’t found. The phytoplankton composition between No.1 and No.2 stomach contents was mostly same. And the phytoplankton compositions of all stations in the reservoir were mostly same. From these results, the catfish may select the zooplankton or feed on the most zooplankton in each season.

The total number of the zooplankton in the stomach contents in October was the most and 1288 individuals, and those in August and December were least and 33 and 34 individuals respectively. And each recaptured time was 11:00 (No. 1), 11:04 (No. 2) and 16:40 (No. 7) respectively. We can recapture the catfish at the scheduled time using the AFR system and we can know the digestive process of the catfish. Therefore, if the sample fish are increased, we will be able to know the feeding time of the catfish in the reservoir.

We obtained some the knowledge about feeding habit of the cultivated young catfish under the natural environment. However, we examined only 3 sample fish in this study, so it is difficult to evaluate quantitatively. It is necessary to continue studying feeding habit of the catfish. And we should like to clarify what the cultivated young catfish feeds on. Furthermore, in order to compare zooplankton with phytoplankton, weight or volume of the plankton will be estimate in the future.

(a)



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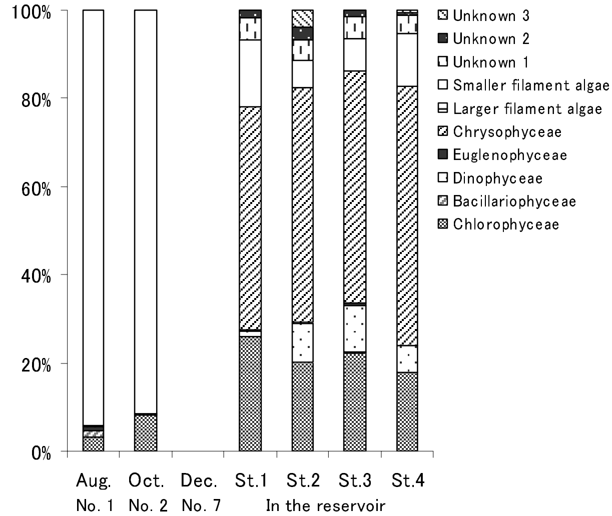
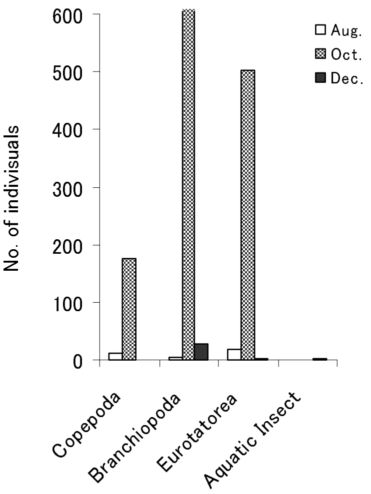


Fig. 3. Plankton composition. (a): Zooplankton and (b): Phytoplankton. Aug., Oct. and Dec. show stomach contents of each month and St. 1 to 4 show plankton in the reservoir.

(a)



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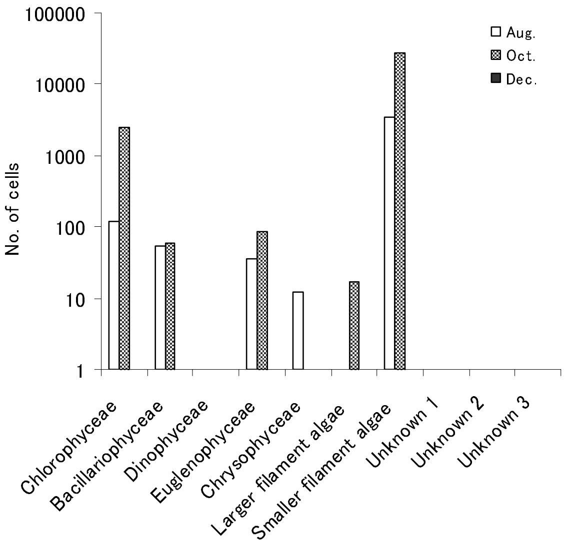

Fig. 4. Total number of the individuals and cells of plankton of the stomach contents. (a): Zooplankton and (b): Phytoplankton.

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Table 2. List of plankton that were found by examination under the microscope.

Class (Subclass)	Order	Family	Genus
Zooplankton			
Crustacea (Copepoda)	-	-	-
Larva	-	-	-
Cru. (Cop.)	Calanoida	-	-
Cru. (Cop.)	Cyclopoida	-	-
Crustacea (Branchiopoda)	Cladocera	-	-
Cru. (Bra.)	Cla.	Bosminidae	-
Eurotatorea (Monogononta)	Ploimida	-	-
Eur. (Mon.)	Plo.	Brachionidae	-
Eur. (Mon.)	Plo.	Synchaetidae	-
Eur. (Mon.)	Plo.	Gastropodidae	-
Eur. (Mon.)	Plo.(Gnesiotrocha)	-	-
Eur. (Mon.)	Plo.(Gne.)	Testudinellidae	-
Eur. (Mon.)	Plo.(Gne.)	Conochilidae	-
Eur. (Mon.)	Plo.(Gne.)	Filinidae	-
Phytoplankton			
Chlorophyceae	Chlorococcales	Oocystaceae	Tetraedron
Chloro.	Chloro.	Hydrodictyaceae	Pediastrum
Chloro	Zygnematales	Desmidiaceae	Closterium
Chloro	Zyg	Desmi.	Staurastrum
Chloro	Zyg	Desmi.	Arthrodesmus
Chloro	Zyg	Desmi.	Xanthidium
Bacillariophyceae (Pennatophycidae)	-	-	-
Dinophyceae	-	-	-
Euglenophyceae	Euglenares (Euglenineae)	-	-
Chrysophyceae (Acontochrysophycidae)	Ochromonadales	Dinobryaceae	Dinobryon
Chryso. (Acon.)	Ochro.	Synuraceae	Mallomonas
Larger filament algae (Unknown)	-	-	-
Smaller filament algae (Unknown)	-	-	-
Unknown 1	-	-	-
Unknown 2	-	-	-